Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Department of Environmental Protection

William F. Weld
Governor
Daniel S. Greenbaum
Commissioner

August 19, 1992

Linda Murphy, Director
Air Management Division
U.S. Environmental Protection Agency
John F. Kennedy Federal Building
Boston, Massachusetts 02203

Dear Ms. Murphy:

Attached please find a copy of the Vehicle Emissions Inpection and Maintenance (I/M) Program Annual Report for 1991. This submittal satisfies Milestone #5 of Output #13 of the 105 Grant.

If you have any questions concerning the contents of this report, please contact James Neely of my staff.

Very truly yours,

Barbara A. Kwetz, Director
Division of Air Quality Control

attachment

BKA/lw

cc: Laurel Carlson, DEP
Herb Redman, DEP
David Gallo, RMV
Peter Hagerty, EPA

VEHICLE EMISSIONS INSPECTION AND MAINTENANCE (I/M) PROGRAM

ANNUAL REPORT FOR 1991

August, 1992

Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Department of Environmental Protection

Division of Air Quality Control
One Winter Street, 7th Floor
Boston, Massachusetts 02108

TABLE OF CONTENTS

MASSACHUSETTS VEHICLE EMISSIONS INSPECTION AND MAINTENANCE I/M PROGRAM ANNUAL REPORT FOR 1991

I. INTRODUCTION

1. OVERVIEW OF THE I/M PROGRAM

According to the Department's most recent emissions inventory, automobiles account for approximately 75% of the uncontrolled carbon monoxide and 60% of the uncontrolled hydrocarbons emitted into the atmosphere. The Vehicle Emissions Inspection and Maintenance (I/M) Program's primary objective is to reduce carbon monoxide and hydrocarbon emissions from gasoline-powered light duty vehicles. The program is contained within the transportation element of the State Implementation Plan, and was designed to replace the former semi-annual safety inspection with an annual inspection procedure incorporating inspection of key safety items with a tailpipe emissions test. The emissions test determines the amount of carbon monoxide and hydrocarbon emissions from the tailpipe of a vehicle and ensures that those emissions are below the allowable limits for the various model years established by the Department of Environmental Protection (Department), formerly the Department of Environmental Quality Engineering. Carbon dioxide (CO_2) levels and engine revolutions per minute (RPM) are also checked to determine whether there are any exhaust leaks, and to ensure that the vehicle is properly at idle. To ensure that emissions testing is accurate and fair, a fully automatic analyzer is used, with the intent of removing the subjectivity from pass-fail determinations. The analyzers also collect and store data on each emissions test automatically. This information assists the Department and the Registry of Motor Vehicles (Registry) in jointly monitoring and administering the Program.

2. CONTENTS AND STRUCTURE OF ANNUAL REPORT

This Annual Report provides statistical and general operations information regarding the I/M Program for the 1991 program year. Reporting and evaluating this information is a necessary component of program effectiveness and quality assurance. The data provided include: general statistics on emissions inspections performed during the program year, including a breakdown of vehicles by cutpoint category; failures of the initial emissions inspection, including a breakdown of the types of emissions-related failures, and; "retest passes," which describe those vehicles which failed the initial inspection, received maintenance, and passed a subsequent emissions retest. Other pertinent program information presented includes Registry compliance and enforcement activities, quality assurance activities with respect to the performance of the emissions analyzers in the field, as well as a general status report on operations activities within the Department during the program year.

One major purpose for the production of this Annual Report is to present an I/M Program status to the U.S. Environmental Protection Agency (EPA). As such, the data contained herein meet the reporting requirements established by the EPA.

The Annual Report for 1990 (September, 1991) should be considered as a companion piece to this report. It contains a comprehensive overview of the I/M Program functions and operations, an historical perspective on program implementation, an in-depth discussion on data management and quality assurance, and various programmatic changes that have been instituted over the past several years.

II. I/M PROGRAM OPERATIONS

1. INTRODUCTION

The I/M Program is a data driven program. General maintenance of the various databases housing the data generated by the I/M Program entails quality assurance and quality control, while ongoing evaluation of the data includes generating reports which represent the data and analyses of those data. These are necessary program components for ensuring data integrity, as well as for evaluating program effectiveness. This section discusses the I/M data from a technical operational perspective, including summaries of (1) inspection transaction data, (2) public outreach and public information statistics, and (3) analyzer audit program data for the 1991 program year.

2. SUMMARY OF PROGRAM DATA

(a) Inspection Data

This portion of the report presents data primarily contained in the Department's I/M database for the period January 1 through December 31, 1991. Emissions and safety data for each vehicle inspection performed with an approved emissions analyzer at an inspection station are recorded onto a cassette tape which is housed within each analyzer. Routine collection of these data and submittal to the Department is required of each of the four emissions analyzer suppliers (Allen Testproducts Division, Bear Automotive Service Equipment Co., Environmental Systems Products, and Sun Electric Corporation), under a contractual agreement between each supplier and the Department. During prescribed, routine monthly preventive maintenance (PM) visits to each station, the supplier's service technician removes the used data cassette from each machine and replaces it with a blank cassette. The collected cassettes are then transferred onto a 9-track master tape at the supplier's facility, which in turn is sent to the Department for further processing and analysis no later than

45 days after the close of the month. Table II-1 displays the type of data recorded onto the cassettes and the format in which it is submitted to the Department for analysis.

Once received by the Department, each tape is processed automatically and consolidated into the I/M database (transaction file). The I/M transaction file is one of the largest databases in the Department. Approximately 3.5 million inspection records can be expected annually. The records are processed using the State College Regency Computer Network (RCN). The Department has maintained a contract with RCN annually for computer support throughout the fiscal year for anticipated demand for I/M data requests. A number of quality assurance (QA) checks and queries are made, and reports are run on these data on a monthly, quarterly, and yearly basis. To perform these functions, the Department spends approximately $5100 each year in computer time alone.

Once all data tape submittals for 1991 were accounted for and their integrity ensured, the tapes were consolidated, first by month and then by quarter, so that the data could be selected and processed in the aggregate, and not only by each analyzer supplier.

The aggregated I/M inspection transaction file for program year 1991 contains upwards of 3.3 million records. Given the enormous size of the file, and the specificity of the reporting requirements, it was necessary to cull out of the database only those records which were applicable for the analyses called for in this report. This process was done by developing selection criteria based upon a number of factors such as: performance of the analyzers (i.e., the manner in which each analyzer records data onto the cassette); the inspection procedure (i.e., what data are input manually during inspection by the certified inspector); and general inspection requirements (e.g., which vehicles are "exempt" from combined safety and emissions inspection and only require a safety inspection, emissions cutpoint categories, etc.). Once the selection criteria were established, over 20 separate output files were set up to handle the data as they were selected, sorted, and counted. Examples of these files are described in Appendix A, "Request for Data for 1991 I/M Annual Report." After sorting and counting, the retest data were then processed through a computer program which matched records by license number to the file comprised of all initial failures for the calendar year in order to ascertain the number of vehicles which initially failed the emissions inspection and passed a subsequent retest (retest passes). Initial failures which were not matched to a retest in the initial month were saved to compare with retest passes in subsequent months. However, retest passes not matched to an initial test were not counted.

TABLE II-1
Format for Individual Inspection Transaction Records

FIELD	LENGTH	COLUMN
Station Number	7	1-7
Date (MMDDYY)	6	8-13
Inspector Number	5	14-18
Type of Test I for Initial R for Retest C for Challenge	1	19
Vehicle Make	5	20-24
Vehicle Year	2	25-26
Odometer (thousands)	4	27-30
Plate Number	8	31-38
Fuel Type G for Gas D for Diesel	1	39
Vehicle Type A for Passenger Auto B Light Duty Truck C for Motorcycle D for Heavy Duty Truck E for Exempt	1	40
Air Pump Y for Yes N for No	1	41
HC PPM	4	42-45
CO% x 100	4	46-49
CO2 x 100	4	50-53
Sticker Number	8	54-61
The following 16 Pass/Fail bytes are code 0 for Pass 1 for Fail		
CO2%	1	62
CO%	1	63
HC	1	64
Fuel Filler Neck	1	65
Catalytic Converter	1	66
Other	1	67
Bumper/Fenders	1	68
Number/Plates	1	69
Window/Wipers	1	70
Horn	1	71
Steering System	1	72
Muffler Exhaust	1	73
Turn Signals	1	74
Head Lights	1	75
Brakes	1	76
RPM	1	77

Figure II-1 presents a breakdown of the 3,360,956 inspection transactions contained in the transaction file by inspection type. Since all 3.3 million transactions, including initial tests, retests, and exemptions, are stored in one data system, it is imperative that in analyzing the data the intricacies of the operation of the analyzers, as well as data reporting and inspection procedures, are taken into account. Possible abuses of the system, e.g., methods to sidestep a full emissions inspection, were taken into account during data analysis. The overall issue of data capture and data integrity, and its effects on data analysis, has been discussed in detail in Section III of the Annual Report for 1990.

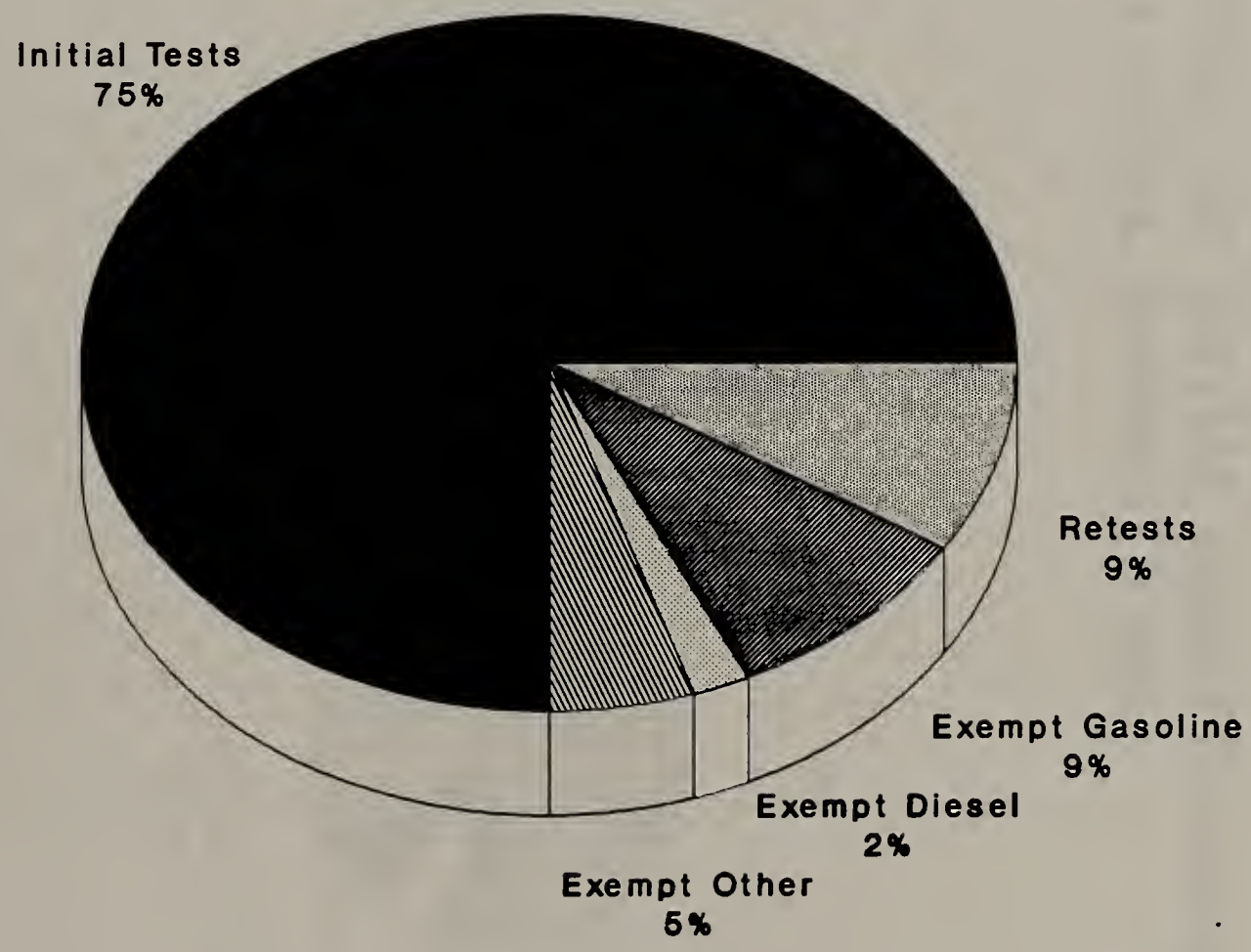
A breakdown of the initial inspections is presented in Figure II-2. During data processing, a count of all initial inspections performed was made, as well as a selection and count of only the last initial inspection in cases where a vehicle is repeatedly tested. This is reflected in the "Multiple Tests" category on the right-hand pie chart in Figure II-2. There is a 6% discrepancy between these two figures for the 1991 data, as 2,530,070 initial inspections appear to be performed on 2,376,744 vehicles. There may be several reasons for this phenomenon. A vehicle may have failed the inspection and was then given minor adjustments in the inspection bay and immediately retested as an initial inspection. Or perhaps this reflects inappropriate practices with respect to established inspection procedures. For the purposes of this report, and to evaluate program effectiveness, the more appropriate base figure from which to work is the number of vehicles receiving initial emissions inspections, i.e., 2,376,744. The 6% discrepancy is marginally higher than the 5% discrepancy found in the 1990 data.

During data analysis, efforts were also made towards characterizing the "exempted vehicles," and to assess whether there is a common practice of illegally exempting vehicles which should undergo an emissions test from the procedure. The data indicate that, of the initial tests, 69,657 vehicles, or 3%, were improperly exempted. Of the 101,612 retests matched to an initial test through the license plate, 2807 vehicles, also comprising 3%, were improperly exempted. These rates are consistent with the 1990 data.

As a result of similar findings during data analysis in 1990, screenings of the manufacturers' monthly data submittals were planned to be instituted during the processing of the 1991 data in order to better assess the magnitude of the "multiple initial inspection" and "improper exempt" problems, and to direct enforcement efforts towards bringing stations which have demonstrated apparent abuse of the inspection procedure into compliance. To date, one of the three screening procedures planned for has been developed and implemented during the 1991 program year. Current plans are underway, in coordination with

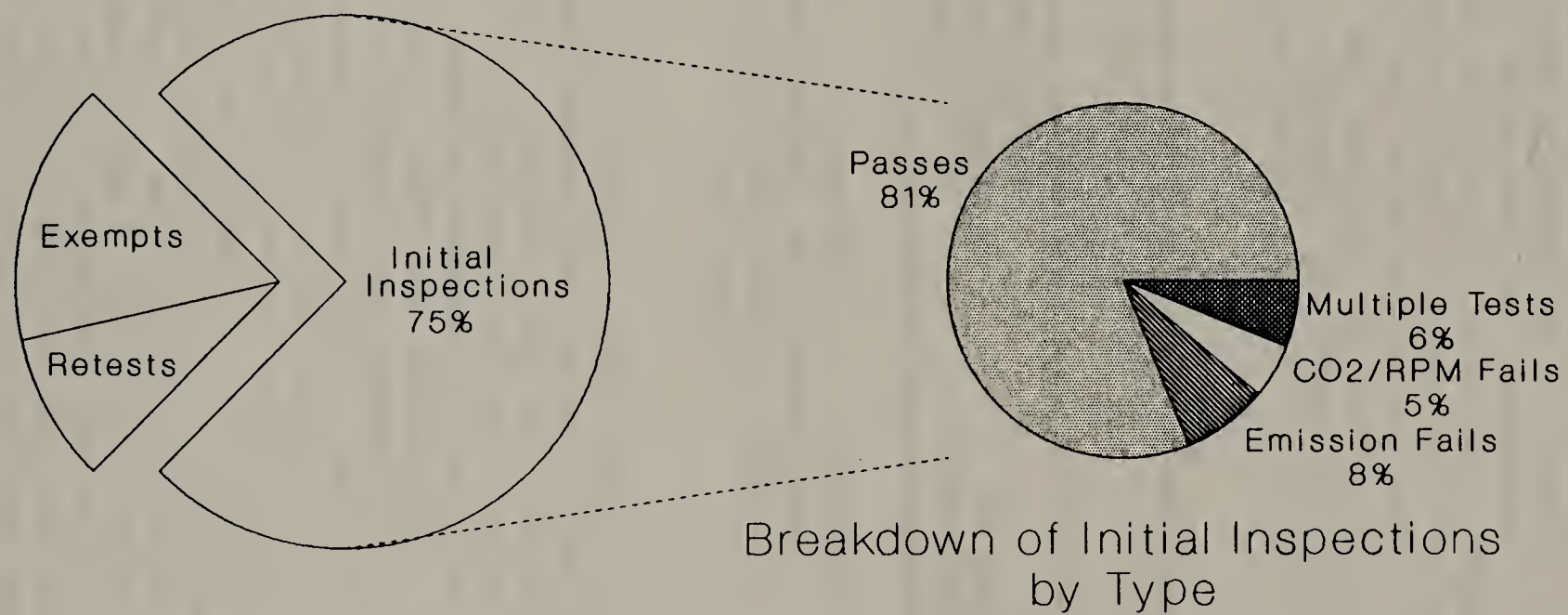
FIGURE II-1
1991 INSPECTION TRANSACTION FILE

Breakdown of File by Transaction Type for 3,360,956 Inspections



Exempt Other includes heavy duty trucks and motorcycles.

FIGURE II-2
RELATIONSHIP OF INITIAL INSPECTIONS TO TOTAL INSPECTIONS



the Registry of Motor Vehicles, to focus efforts on the remaining screening applications.

Table II-2 describes the number of vehicles registered in the Commonwealth by the Registry of Motor Vehicles during calendar year 1991 versus the number of vehicles receiving an initial emissions inspection. Since emissions inspections are only required of light duty, gasoline powered vehicles which are less than 15 model years of age, a percentage of the registered motor vehicle fleet are not subject to the emissions inspection requirement, hence one explanation for the discrepancy between the two numbers. Also not included in the vehicles requiring emissions inspections are diesel-powered vehicles, trucks with a curb weight of greater than 8500 lbs., motorcycles, and new vehicles purchased within its respective model year but no greater than 12 months old. In addition, the use of "exempt" status to inappropriately or unlawfully bypass the emissions inspection occurs, and thus may be accounted for in this number. It is also possible that the number of vehicles registered may actually represent the number of registration transactions, as opposed to actual registered vehicles. These explanations may account for some of the difference between the two numbers. The most compelling reason for the bulk of the discrepancy, however, most likely has to do with data capture. The available data indicate that at least 58% of registered Massachusetts vehicles received an initial emissions inspection in 1991.

TABLE II-2
Number of Vehicles Requiring
and Receiving Inspections
(January 1 - December 31, 1991)

NO. OF VEHICLES REGISTERED BY THE RMV	NO. OF VEHICLES RECEIVING INITIAL EMISSIONS INSPECTIONS
4,096,665	2,376,744

Table II-3 presents a breakdown of initial inspection passes and failures in 1991 by cutpoint category. The cutpoint categories were established to achieve the I/M Program's emission reduction targets, and correlate with the increasing stringency required of emission control equipment installed in vehicles as required by the EPA. The overall initial non-safety failure rate was 14.1%, while a breakdown of the rates by cutpoint category indicated a larger spread, the highest being a 22.9% failure rate for the 1977-1979 fleet. This rate is consistent with but

slightly higher (i.e., three percentage points higher) than the previous program year. These failures represent the full complement of emissions-related failures, i.e., exceedances of the established hydrocarbon (HC), and/or carbon monoxide (CO) cutpoints (emissions failures), as well as the carbon dioxide (CO2) leak check, and the idle check (RPM). It should be noted that the latter two are built-in lock-out features to the analyzers and do not constitute true emissions failures. Once engaged, the lock-out feature prevents the emissions test from being completed until the CO2 or RPM malfunction is corrected. Non-safety failures do not include the inspection of the fuel filler neck restrictor or the catalytic converter. Failures in these categories are not treated as emissions failures in the database, as they are visual inspections rather than functional tests.

TABLE II-3
Number of Vehicles Receiving
Inspections by Cutpoint Category
(January 1 - December 31, 1991)

CUTPOINT CATEGORY	NO. INITIAL INSPECTIONS	NO. PASSING INITIAL INSPECTION	NO. NON-SAFETY FAILURES	FAILURE RATE (%)
1981+	2,129,931	1,849,983	279,948	13.1
1980	73,530	58,385	15,145	20.6
1977-1979	173,283	133,587	39,736	22.9
TOTAL	2,376,744	2,041,915	334,829	14.1

The non-safety failures are further broken down in Table II-4. There is a wide spread across cutpoint categories for emissions. The fleet of vehicles for model years 1977-1979 has the highest failure rate for emissions, at 15.8%, nearly twice that of the rate for the 1981+ fleet. The overall emissions failure rate is 9.2%. The CO2/RPM failures, as a percent of total inspections, is more consistent across the 1980 and 1977-1979 cutpoint categories, the 1981+ fleet having a slightly lower rate.

Data on those vehicles which failed the initial emissions test and subsequently passed a retest (presumably after remedial work such as a tune-up) are presented in Table II-5. It has been noted that the number of initial failures does not match the number of retested vehicles reported. In fact, the overall

TABLE II-4
Breakdown of Non-Safety Failures
by Type and Cutpoint Category
(January 1 - December 31, 1991)

CUTPOINT CATEGORY	NO. EMISSIONS FAILURES*	% OF TOTAL INSPECTIONS	NO. CO2/RPM FAILURES	% OF TOTAL INSPECTIONS
1981+	180,563	8.5	99,385	4.7
1980	10,150	13.8	4,995	6.8
1977-1979	27,332	15.8	12,404	7.2
TOTAL	218,045	9.2	116,784	4.9

* Includes HC and/or CO failures

TABLE II-5
Breakdown of Failures and Matched
Retest Passes by Cutpoint Category
(January 1 - December 31, 1991)

CUTPOINT CATEGORY	NO. OF INITIAL EMISSIONS FAILURES (HC/CO)	NO. OF MATCHED RETESTED VEHICLES CAPTURED (%)	NO. OF MATCHED RETEST PASSES CAPTURED
1981+	180,563	84,213 (46.6%)	73,211
1980	10,150	4,550 (44.8%)	3,981
1977-1979	27,332	12,849 (47.0%)	11,462
TOTAL	218,045	101,612 (46.6%)	88,654

retest pass capture rate appears to be quite low, at 46.6%. This is somewhat higher than and reverses the previous trend of a slight, continual lowering of the retest pass capture rate since 1987 (45.4% in 1987, 43.6% in 1988, 42.8% in 1989, and 41.3% in 1990). There are a number of reasons why a failed vehicle may not be matched to a follow-up retest. Many of these reasons have to do with data capture (e.g., incomplete data cassette-to-9-track submittals), data entry errors on the part of the certified inspector (e.g., typographical errors which prevent a plate match during data processing), inappropriate use of the "exempt" status, or erroneous use of the "initial" versus "retest" status.

There is also a population of vehicles which may have, in fact, failed an initial inspection and never received a retest. These vehicle may, in the interim, have been in an accident and junked, stolen, put into storage, or moved to another state. It is also possible that the owner of the failed vehicle may have secured a certificate of inspection through other means, and not through the typical retest procedure route. All combined, they may artificially inflate the number of initial inspections and suppress the true retest pass rate.

Despite apparent concerns regarding the retest-pass capture rate, the consistency across all cutpoint categories is important to note. It should also be noted that, of the retest population captured, the overall retest failure rate was 12.8%.

Table II-6 presents data on the number of inspection certificates, waivers, and temporary maintenance forms issued by the Registry in 1991. Inspection certificates do not include certificates of rejection. Unused Inspection Certificates are returned to the Registry, and are not resold. Certificates of Rejection are not sold, but rather are given out by the Registry. There is no formal bookkeeping mechanism at the Registry which tracks the number of unused Inspection Certificates returned, nor the number of Rejection stickers actually issued in 1991.

TABLE II-6.
Summary of Certificates Issued on Vehicles;
Inspections, Waivers, And Temporary Maintenance Forms
(January 1 - December 31, 1991)

TYPE OF CERTIFICATE	NUMBER
Inspection Certificates Sold	4,168,116
Waivers	258
Temporary Maintenance Forms	9

3. PUBLIC OUTREACH AND PUBLIC INFORMATION

(a) Phone Log/Public Inquiries

One major aspect of program operations within the Department involves public outreach and public information. In 1991, the Department received numerous telephone calls and written requests from a variety of sources which included businesses, inspection stations, the general public, and local, state, and federal

agencies. Inquiries were initiated by requestors for a variety of reasons. The requests ranged from searches of one of the databases for specific information, to queries regarding waiver procedures, to general questions about the program. Table II-7 presents a breakdown of the types and number of telephone queries which were logged-in during 1991. Inquiries regarding revised certification procedures instituted in November, 1990 comprised the bulk of the information requests during 1991.

A breakdown of the calls logged-in during 1991 by requestor is presented in Table II-8. Calls from inspection stations comprised the bulk of the queries.

Since the I/M databases are public record, it is part of the Department's responsibility to respond to requests for access to those data. As shown in Table II-8, there were 38 information request for data searches of the transaction file. These requests are routed to the Information Systems Branch, and require that individual 9-track tapes are hung at the State College and searched, based on the specific parameters of the request. Processing these requests takes a certain amount of time, sometimes several weeks, due in part to the sheer volume of the database that must be searched and the fact that the Department competes with other state agencies for computer time. Some requests require the generation of printouts spanning several years of data for a particular station, and others require one transaction listing for a particular station on a particular date. Both requests, however, require, <u>at a minimum</u>, the hanging of at least one tape, and a search through at least one full month's worth of data for one analyzer, which translates into a search through an average minimum of 86,000 records.

(b) <u>New Posters and Failure Brochures</u>

Because the I/M program requires the past 15 vehicle model years be subject to emissions inspections and the pass/fail cutpoints are tagged to model year groupings, the Department annually produces wall posters for licensed inspection stations to display for the public (see Appendix B). As such, the Department must layout and have printed approximately 3000 I/M posters each year to reflect the changing applicable model year.

The Department also produces approximately 380,000 failure brochures (see Appendix C). This brochure is distributed at the inspection stations at the time of an inspection failure. By regulation, failure brochures are required to be distributed in order to properly explain the likely causes and suggested courses of action for any motorist who fails his or her emissions inspection.

TABLE II-7
Number and Types of Telephone Inquiries
Regarding the I/M Program
(January 1 - December 31, 1991)

TYPE OF INQUIRY	NO. OF CALLS
Specific Program Component*	166
Inspector Related (Certification/Transfer)	259
Analyzer Audit Program	1
Records Search (ISB)**	38
Data Printout Request (APIB)***	10
Payment of Monthly Preventive Maintenance Fee	10
Coverage under Service Contract	8
Analyzer Software Changes	15
Service Station Complaints	12
CAAA 1990/BAR 90/Enhanced I&M	32
Toxics/Alt.Fuels/New Tech.Vehicles	8
Enforcement	12
Total Inquiries	571

* Includes issues such as warranties, waivers, imports, consumer protection, engine switching, failures in RPM, catalytic converters and fuel filler necks, and special test procedures

** ISB = Information Systems Branch within the Division of Air Quality

*** APIB = Area Programs Implementation Branch within the Division of Air Quality

TABLE II-8
Breakdown of Logged In Telephone Inquiries
by Requestor
(January 1 - December 31, 1991)

REQUESTOR	NO. OF CALLS	% OF TOTAL
Inspection Stations	287	50.3
General Public	167	29.2
Massachusetts Agencies (Local,State)	42	7.4
Analyzer Manufacturers	33	5.8
Businesses & Affiliated Agencies	31	5.4
Other State Agencies	6	1.0
Legislature/Exe. Office	5	0.9
TOTAL	571	100.0

4. COMPLIANCE AND ENFORCEMENT ACTIVITIES

The I/M program is jointly administered by the Department and the Registry. The Registry is primarily responsible for the oversight, management, administration, and day-to-day operations of the licensing, compliance, and enforcement activities at the inspection stations, on the road, and with regard to the safety conditions of motor vehicles. The Department is responsible for the general oversight, management, administration, and day-to-day operations of the compliance, quality control, and data management of the emissions portion of the inspection program.

(a) Licensed Inspection Stations

A summary of Registry compliance and enforcement activities at the licensed inspection stations is presented in Table II-9. The number of routine station visits includes all classes of stations (A, B, C, and D). Class A stations are public inspection stations for safety and emissions inspections, stations with a class B license conduct fleet inspections for safety and emissions, class C stations are fleet inspection stations for safety inspections only, and those public inspection stations which perform safety only inspections hold a class D license.

The Registry of Motor Vehicles utilizes four state vehicles for covert inspections and other compliance activities. Two of these vehicles have been tampered with purposefully (with EPA's approval) and are used to monitor the completeness and overall performance of the emissions inspection. Registry inspectors' personal vehicles are also used for covert inspections. All covert inspections are based on probable cause using documentation such as Department enforcement reports, motorist complaints, excessive Certificate of Inspection sales, and Registry Inspectors' documented observations. Inspection station administrative audits are also conducted on a rotating schedule, in accordance with the provisions of 540 CMR 4.08. Any irregularities observed or found by the Registry inspector relative to inspections, audits, or paperwork are recorded, along with a compliance response appropriate to the severity of the infraction.

Sticker surveys are also conducted across the Commonwealth and are important to assure motorist compliance with the inspection regulations. Vehicles not displaying the required Certificate of Inspection are issued a Registry of Motor Vehicles Courtesy Reminder card. Typically, the data indicate a noncompliance rate of less than 3%.

TABLE II-9
Summary of Station Compliance Activities
(January 1 - December 31, 1991)

ACTIVITY	NUMBER
Licensed Inspection Stations	2897
Station Revocations	4
Station Suspensions Issued	231
Covert Station Visits	103
Courtesy Cards Issued	71
Routine Station Visits	15,392

(b) Certified Inspectors

The Department has established a certification program for individuals who wish to become inspectors to conduct emissions testing. Such certification involves training by each supplier and is based upon a proficiency determination on the use of the

equipment. Once trained by the supplier, an inspector must complete and submit a Massachusetts Emissions Inspector Certification Form to the Department. Upon review of the information contained on the form, the Department issues the certification directly to the inspector. According to the Department's records, currently there are approximately 13,000 certified inspectors in the Commonwealth.

A new emissions inspector certification initiative was implemented in November, 1990 to enhance quality assurance of this aspect of the program. Since that time, 2816 inspector certifications have been issued by the Department. Table II-10 below, portrays the number of inspectors that received initial certifications or underwent recertification during the periods November 3 - December 31, 1990 and January 1 - December 31, 1991. The 1990 data are being reproduced to correct an error in the Annual Report for 1990, which inadvertently reported these data for the period November 3, 1990 - May 31, 1991.

TABLE II-10
Breakdown of Inspector Certifications
and Recertifications

November 3 - December 31, 1990

TYPE	NUMBER	% OF TOTAL
New Inspectors Certified	283	84.5
Current Inspectors Recertified	52	15.5
TOTAL [redacted]	335	

January 1 - December 31, 1991

TYPE	NUMBER	% OF TOTAL
New Inspectors Certified	2026	81.7
Current Inspectors Recertified	455	18.3
TOTAL [redacted]	2481	

5. EMISSIONS ANALYZER AUDIT PROGRAM AND ANNUAL SUMMARY

(a) Introduction

The Massachusetts Emissions Analyzer Audit Program was first introduced on April 1, 1986. The Program is designed to assess and determine the accuracy of the emissions analyzers in reading known concentrations of specific test gases which simulate automotive exhaust, and to assess the overall performance of the analyzers in the field.

The Analyzer Audit Program is an integral part of the quality assurance (Q/A) program for the I/M Program, and is detailed in the Quality Assurance Plan for the Automobile Emissions Inspection and Maintenance Program (February, 1990). The personnel involved in this program are called state auditors. The Registry is responsible for conducting initial audits on all state approved analyzers in use twice per year. The Department is responsible for reauditing all analyzers which fail the initial audit for gas-related failures (HC and/or CO). The Department provides technical training to Registry auditors on the use of the audit equipment. The Department also designs, purchases, and supplies the audit equipment for Registry use.

There are six approved emissions analyzer models which are produced by four manufacturers (Allen Testproducts Division, Bear Automotive Service Equipment Co., Environmental Systems Products (formerly Hamilton Test Systems), and Sun Electric Corporation) for use in the I/M Program.

The data in this section of the report, which were obtained from 2,184 audits performed during 1991, were generated from a database using dBASE III PLUS.

(b) Initial Audit Results

Summary results of initial audits performed by the Registry for 1991 are described in Table II-11. The overall analyzer failure rate for initial audits was 13.9% for this period. This is a slightly higher failure rate than for calendar year 1990 (12.3%).

TABLE II-11.

SUMMARY OF INITIAL AUDITS
(January 1, 1991-December 31, 1991)

INITIAL AUDITS	NUMBER PASS	PERCENT PASS	NUMBER FAIL	PERCENT FAIL
2184	1881	86.1%	303	13.9%

An analyzer can fail an audit for one or more reasons. These include problems with gas calibration (HC, CO, or both), and non-gas related problems such as faulty probe tip or hose, inaccurate date, leaks in the system (Leakcheck), printer failure, and failures included in the "Other" category indicated on the Analyzer Audit forms and Cease and Desist Orders. These "Other" failures include: calibration failures, lack of or missing PEF number (Propane Equivalency Factor -- which is used to calculate the HC and CO emissions during an analyzer audit), and incorrect time, which indicates that the internal clock in the analyzer needs to be adjusted.

(c) Initial Audit Results by Manufacturer

A breakdown of initial audits and pass/failure rates by manufacturer is presented in Table II-12. The Department's records indicate that 1,662 analyzers were audited once during the year, and 252 analyzers were audited twice. In addition, 6 analyzers were audited three times. A total of 389 analyzers, or 17% of the analyzers, were not audited in 1991.

TABLE II-12.

BREAKDOWN OF INITIAL AUDIT
RESULTS BY MANUFACTURER
(January 1, 1991-December 31, 1991)

	NUMBER OF ANALYZERS	NUMBER AUDITS	PERCENT AUDITED	NUMBER PASS	PERCENT PASS	NUMBER FAIL	PERCENT FAIL
ALLEN	60	50	83.33%	41	82.0%	9	18.0%
BEAR	371	388	104.58%	310	79.9%	78	20.1%
ESP	1471	1366	92.86%	1172	85.8%	194	14.2%
SUN	407	380	93.37%	358	94.2%	22	5.8%
TOTAL	2309	2184	94.59%	1881	86.1%	303	13.9%

Bear analyzers, in this report and previous reports, continue to have the highest failure rate compared to the other manufacturers. Bear had a failure rate of 20.1% for this reporting period, compared to 21.8% for the 1990 reporting period. Sun analyzers continue to show the lowest failure rate, at 5.8%. Sun's failure rate for 1990 was 4%. Allen analyzers had a failure rate of 18%, which is slightly lower than the 1990 failure rate of 19%. ESP's failure rate of 14.2% was higher than the 1990 failure rate of 11.7%.

It should also be noted that the reported numbers of analyzers per manufacturer (i.e., the denominator for determining the failure rates) have been updated from the previous audit report (2,309 analyzers this report compared to 2,246 for the 1990 report). Due to ever changing factors such as contract cancellations, as well as the addition of new stations entering the inspection system and stations deciding to leave the program (permanently or temporarily), the exact number of analyzers operating in the inspection program can actually vary on a monthly basis.

(d) Number of Initial Audits Based on Failure Type

Table II-13 shows the number of audit failures, broken down by failure type. Overall, 209 or 69% of the 303 initial audit failures were due to gas-related problems. This is slightly lower than the 1990 analyzer audit data, which indicated a gas-

TABLE II-13.

NUMBER OF FAILED INITIAL AUDITS BASED ON FAILURE TYPE
(January 1, 1991-December 31, 1991)

TYPE OF FAILURE	NUMBER OF AUDITS	PERCENT OF FAILED AUDITS (303)	PERCENT OF INITIAL AUDITS (2184)
Gas only	118	39.0%	5.4%
Non-gas only	88	29.0%	4.0%
Gas & Non-gas	91	30.0%	4.2%
Unknown*	6	2.0%	0.3%
TOTAL	303	100.0%	13.9%

* For six audits, only a Cease and Desist Order was submitted to the Department, and failure information is not indicated on these forms.

related failure rate of 77.1%. A further breakdown of the data indicates that of the 209 gas-related audit failures, 62 analyzers failed for HC only, 36 analyzers failed for CO only, and 111 analyzers failed for both HC and CO. Previous audit reports also indicate that the majority of gas-related failures were for both HC and CO.

(e) Frequency of Analyzer Failure Items

• Gas Failure Items

Table II-14 shows the frequency of various failure items for the initial audits, with a breakdown by manufacturer. The highest gas-related failure rate item was HC, with 173 failures comprising 7.9% of total initial audits. Fifty-four percent (54%), of the total gas-related failure items (320), were for HC. For the 1990 analyzer audit report, fifty-seven percent (57%), of the total gas failure items (362), were for HC. The 1991 CO failure rate was relatively close to the HC failure rate, at 6.7% of total initial audits, comprising 46% of the gas failures.

An HC failure can often be attributed to a buildup of hydrocarbons (carbon soot) in the analyzer. A large percentage of the buildup occurs in the probe tip/hose, tubing, or filter bowl. Water buildup (condensation from car exhaust) often collects in the filter bowl, causing high HC levels. A CO failure most often is a result of the bench being out of calibration, or due to leaks in the system.

While Environmental Systems Products (ESP) analyzers appear to have had the highest frequency of HC and CO failures, it should be noted that 63% of the initial audits were performed on ESP analyzers. If, however, the frequencies are weighted based on the number of analyzers audited for all four analyzer manufacturers, Bear analyzers have the highest gas failure rate.

• Non-Gas Failure Items

Table II-14 also contains data on frequency of non-gas failure items. Leak check failures were the most frequent non-gas failure item. A leak check failure indicates that calibration gas is leaking from the analyzer's pneumatic system. The pneumatic system is made up of the external plumbing (probe tip and hose) and the internal plumbing (tubing, piping, filter bowl, and pumps). Probe tip/hose failures occur when the rubber tubing becomes brittle over time and the piping develops cracks, or become loose at its connection. These conditions can also result in a leak check failure. If the probe tip becomes crushed or cracked, and if the probe tip hose is leaking, then a leak check failure will occur. The filter bowl, which is either glass or plastic, can crack or have a loose filter. Any of these leak check failures that occur during the "Initial Check" of the audit

TABLE II-14.

BREAKDOWN OF VARIOUS FAILURES AND THEIR FREQUENCIES FOR INITIAL AUDITS PERFORMED (Total Failures and Manufacturer Breakdown January 1, 1991-December 31, 1991)

FAIL ITEM	FREQUENCY	FAILURE * RATE (%)	ALLEN	BEAR	ESP	SUN
HC	173	7.9%	6	44	111	12
CO	147	6.7%	3	40	90	14
PROBE TIP	29	1.3%		20	9	
DATE	31	1.4%		5	25	1
LEAKCHECK	75	3.4%	1	25	42	7
PRINTER	21	1.0%	2	4	15	
OTHER	59	2.7%		21	32	6

* Frequency of failures for each fail item divided by total initial audits (2,184)

will shut down the analyzer, and prevent the auditor from obtaining any HC or CO values. Most of the leak check failures recorded, however, occurred during the "Recheck" portion of the audit procedure, when a gas item failed.

In 31 initial audits the date that is displayed on the analyzer terminal was incorrect and had to be adjusted. Analyzer printers failed during 21 initial audits, and were either repaired or replaced.

There were 59 failure items that were accounted for under the "Other" category as follows: incorrect or lack of PEF number (15), gas calibration failure (12), incorrect time (10), electrical calibration (5), out of calibration gas (3), automatic calibration (2), no tint meter (2), repair not indicated (2), miscellaneous (8).

(f) Repairs to Failed Analyzers

After an analyzer fails an audit, a Cease and Desist Order is issued by the state auditor. The Cease and Desist Order is printed on carbonless (NCR) paper and has 4 copies. The inspection station is informed of the fact that the analyzer cannot be used for inspection purposes until an analyzer manufacturer service technician repairs the analyzer. One of the

copies of the Cease and Desist Order is returned to the Department by the state auditor, and the remaining copies are left at the station. It is the station owner's responsibility to schedule a service call for the analyzer to be repaired to a condition suitable to conduct inspections. When the service call occurs at the station, the service technician indicates on the Cease and Desist Order which repairs were performed, and sends a copy of the completed Cease and Desist Order containing this information to the Department.

Table II-15 displays the number of failed initial audits and the status of the accompanying Cease and Desist Orders for these failures. Of the 303 failed initial audits, 10 Cease and Desist Orders were not received. Of the 293 Cease and Desist Orders received, 244 were completed and returned to the Department by a service technician. The 49 missing Cease and Desist Orders may not have been received for a number of reasons: The station owner may not have contacted the service technician regarding the failed analyzer, the service technician never completed the Order because the station owner misplaced the Order, the service technician repaired the analyzer and then either misplaced or did not complete the paperwork. In the third quarter of 1991, the Department sent listings of missing Cease and Desist Orders to each manufacturer and requested an accounting of the outstanding paperwork. Fifteen percent of the missing Orders were accounted for by the manufacturers. Any missing Cease and Desist Orders hinder the Department's ability to adequately ascertain whether and what repairs were performed to bring a failed analyzer into compliance.

TABLE II-15.

STATUS OF CEASE AND DESIST ORDERS RECEIVED BY THE DEPARTMENT BROKEN DOWN BY ANALYZER MANUFACTURER

ANALYZER MFG.	NO. OF FAILED INITIAL AUDITS	TOTAL NO. OF C/D ORDERS RECEIVED	NO. OF COMPLETED C/D ORDERS	NO. OF INCOMPLETE C/D ORDERS
ALLEN	9	8	5	3
BEAR	78	76	57	19
ESP	194	187	163	24
SUN	22	22	19	3
TOTAL	303	293	244	49

A complicating factor is a lack of a common language among the analyzer manufacturers to describe repair activities. Some of the repair terms used by the service technicians have some uncertainty in their meaning. This is largely due to the fact the data are generated from a large number of service technicians, each with his own interpretation of the various repair codes. For example, the term "recalibrate" in most cases refers to the calibration of the bench, but could mean the calibration of other components of the analyzer. In addition, many service technicians perform certain repairs and calibrations, but do not indicate them on the Cease and Desist Orders. When a gas failure occurs, for example, it is standard protocol that examination of the tubing, hoses, and pumps occur, followed by a leak check test. These types of repairs and diagnostics, however, are not necessarily recorded on the Cease and Desist Orders.

Table II-16 describes the various types of repairs which were performed on analyzers failing initial audits for 1991. If an analyzer fails the audit for more than one reason, it will require several types of repairs. Accordingly, more than one repair code should be indicated for that analyzer. Table II-16 does not necessarily represent the full range of repairs for all failed analyzers for the reporting period, since 49 completed Cease and Desist Orders, which document the specific repairs performed, were not received by the Department at the time of this writing.

- Frequency of Specific Analyzer Repairs

In Table II-16, the most common repair documented on the signed Cease and Desist Orders was to the probe tip and hose, the second most common repair being to the bench. The infrared bench is a critical component of the analyzer, which actually performs the gas analysis and renders the determination whether a particular test passes or fails. It is a unit in which a sample of the exhaust gas from a vehicle is compared to a reference gas with a known value to determine whether it is above or below that value. The Cease and Desist Orders do not differentiate between a full replacement, a repair (e.g., circuit boards replaced), or a calibration to a bench.

There were fewer leak check tests indicated (i.e., 35) than there were leak check failures (i.e., 75). This may be due to the service technician failing to document leak check tests after completion, or failing to perform them. A leak check test is performed by putting a cap over the probe tip and running an automatic leak check test to determine if there are any leaks in the system.

TABLE II-16.
BREAKDOWN OF REPAIR CATEGORIES FOR INITIAL AUDIT FAILURES
January 1, 1991-December 31, 1991)

TYPE OF REPAIR	FREQUENCY	(BREAKDOWN OF FREQUENCY BY MFR.) ALLEN	BEAR	ESP	SUN
DATE/TIME	27		8	17	2
BENCH	36	1	6	28	1
ANALYZER DOWN	3		1	1	1
ELECTRICAL CALIBRATION	24	2	1	18	3
PROBE TIP/HOSE	55		24	23	8
FILTER BOWL	20		3	16	1
LEAK CHECK	35		14	14	7
VACUUM SWITCH	17		3	14	
OTHER	152	3	39	99	11

One hundred and fifty-two repairs were indicated under "Other" repairs. Many analyzers had more than one repair item indicated. Repair comments are also often illegible. Most of the repairs were made on the internal plumbing system of the analyzer. A high number of repairs were made on pump/diaphragm (17). The pump creates the pressure inside the analyzer's plumbing system. The diaphragm (rubber valve) is a component of the pump. In most cases the pump was replaced or repaired, or the diaphragm was ripped and had to be replaced. There were replacements to printers (14), filters (12), rubber tubing (10), hoses/S-pipes (10), and exhaust hoses (7). Apparently the reason so many leak check failures occur is that the tubing, hoses, pumps, pump diaphragms, and filters, which are the internal plumbing system of the analyzer, become clogged, or deteriorate over time. Other items that were replaced or repaired were: batteries (6), Input/Output bench circuit board (4), solenoids (3), VOC switch (2), and tape cassette (1). Once the physical repairs are made on the analyzer, the service technician must

carry out various calibrations to the bench and other electrical and non-electrical components in the analyzer. Any mention of calibrations other than electrical calibration were tallied under "general calibrations" (14).

On five (5) Cease and Desist Orders the service technicians indicated that "no problem was found" with the analyzer, yet these same representatives did not indicate if any calibrations were carried out to reach that conclusion. There were also nine (9) signed Cease and Desist Orders that did not indicate any repairs to the analyzers.

(g) Response Time for Repairs

Of the 244 analyzers repaired by the manufacturer service technicians, 96, or 39%, of the analyzers were repaired on the same day they failed, 86, or 35%, of the analyzers were repaired on the following day, 12, or 5%, of the analyzers were repaired on the second day, 22, or 9%, were repaired on the third day, and 28 or 12% were repaired after 4 or more days. The Department's contract with the analyzer manufacturers requires them to respond within 3 days of an analyzer audit failure for service. The data indicate that in 88% of the cases this requirement is met.

(h) Initial Audit Results by Geographic Location

Table II-17 characterizes the geographic distribution of analyzers in the field by Registry region, the number of initial audits performed by region, the percent of analyzers audited in each region, and their respective pass/fail rates. The Western region highest percentage of analyzers audited (122%), whereas the Metropolitan Boston region had the lowest percentage of analyzers audited (64%).

(i) Reaudit Results

Table II-18 describes the summary results of reaudits which were performed by the Department, Division of Air Quality Control, Air Quality Surveillance Branch, for 1991. Reaudits are performed by Department auditors only when a gas-related failure occurs during an initial audit (i.e., HC and/or CO failures). This accounts for the discrepancy between the 303 initial audit failures in Table III-2, and the 218 first reaudits performed. As the data in the table indicate, all but one of the analyzers which failed the first reaudit were found to be within calibration after the second reaudit. The Department auditors act in a Q/A capacity, and evaluate and report information to the Department on the performance of specific analyzers in the field. They also track Analyzer Audit forms and Cease and Desist Orders that have not been properly completed, and offer training assistance to Registry auditors.

TABLE II-17.

BREAKDOWN OF INITIAL AUDIT RESULTS BY
GEOGRAPHIC LOCATION
(January 1, 1991-December 31, 1991)

RMV REGION	ANALYZERS /REGION	NUMBER OF AUDITS (%)	NUMBER PASS	NUMBER FAIL
CENTRAL	440	351 (78%)	301	50
M-BOSTON	505	325 (64%)	269	56
NORTHEAST	539	541 (100%)	472	69
SOUTHEAST	543	623 (115%)	526	97
WESTERN	282	344 (122%)	313	31
TOTAL	2309	2184	1881	303

TABLE II-8.
SUMMARY OF REAUDITS
(January 1, 1991-December 31, 1991)

	NUMBER REAUDITS	NUMBER PASS	PERCENT PASS	NUMBER FAIL	PERCENT FAIL
1ST REAUDIT	218	186	85.3%	32	14.7%
2ND REAUDIT	26	25	96.1%	1	3.9%
3RD REAUDIT	1	0	0.0%	0	0.0%

III. MANAGEMENT AND OVERSIGHT

Continuing a process that began in 1989, the agency has identified a number of areas within the program in need of reevaluation, and has instituted a number of programmatic changes in response. The Annual Report for 1990 reviews in depth several of the major problem areas, which included manufacturer oversight, data management and reporting systems, and inspector certification, and discusses some of the long and short term

strategies that have been developed to address these shortcomings. Much of the program management and oversight effort during 1991 involved ensuring that the mechanisms and procedures established in 1990 were in fact being implemented.

1. MANUFACTURER OVERSIGHT

(a) General Oversight

As mentioned earlier, four analyzer manufacturers currently have approved equipment being used for safety and emissions inspections in Massachusetts. The relationship which exists between equipment manufacturers and the Commonwealth is governed by several interdependent and interrelated documents. In addition to the I/M Program's enabling act, Department and Registry regulations set the general program requirements and conditions. By regulation, equipment manufacturers must enter into a contractual agreement (Agreement) with the Department that commits the manufacturer to certain requirements between it and licensed inspection stations, in order to assure that inspection stations are treated as fairly as possible in what is essentially a limited market. The Agreement, for example, requires a service contract between the manufacturer and the inspection station, and places a 3-day working day limit on manufacturers to respond to stations for the repair of audit-failed, faulty, or simply broken equipment. The Agreement sets a penalty schedule and triggers for failure to comply with program requirements. The relationship is further established by the Technical and Performance Specification, which places clear and certain technical requirements on equipment manufacturers on the performance of the emissions analyzer proposed for use in the emissions inspection.

Such documents, while they help define the technical, performance, administrative, data management, and other legal program requirements on manufacturers, also establish the means by which the Department and the Registry can exercise their oversight responsibilities.

(b) Specific Issues

Routine quality assurance of the analyzer audit data has continued to identify problems with service technicians failing to return completed Cease and Desist Orders to the Department. During the third quarter of 1991 the Department sent each analyzer manufacturer a list of missing signed Cease and Desist Orders, and asked for an accounting of them. Most of the manufacturers subsequently tracked and returned more than 50% of the missing orders. This is a significant improvement in data capture than in previous program years.

2. TRAINING

The Department, during 1991, acted to meet a perceived need to inform gasoline service stations and automotive repair shops, many of whom are licensed inspection stations, about the full range of the regulatory requirements in places on this sector. The Department offered this particular industry the opportunity to learn first hand about the regulations that directly affect their businesses. In addition, it was a chance for the Department's program staff to hear the issues of concern directly from the sources it regulates. The forum chosen was a series of 4 one-day workshops held across Massachusetts. The Department was represented by staff from all its environmental programs: air, hazardous waste, solid waste, water pollution control, etc. The primary objective of the workshops was to assist this sector of the regulated community in maintaining compliance with all of the Department's regulations. Part of the segment from the Air Quality Control Division was focussed on the I/M Program. While most of the planning for these compliance assistance workshops was done in 1991, the workshops themselves were held in the Spring of 1992.

3. DATA ISSUES

The Department's efforts to identify and resolve what were found to be controllable data capture issues, especially with regard to monthly data submittals, has continued to improve the efficiency and effectiveness of the data management system. During the 1991 program year, the Department continued to enforce the data reporting requirements contained within the Agreement between the Department and each manufacturer and the Technical and Performance Specifications. With very few exceptions, monthly inspection data tapes were submitted in the proper format, and within the prescribed deadlines.

The data were also routinely reviewed to ascertain whether the submittals contained data only for the reporting month. The Department found that, with the exception of one manufacturer, the monthly data tapes contained data for the month of submittal. In the case where data submittals were not appropriately segregated by month, discussions between the manufacturer and the Department ensued, and corrections to the data processing procedure were initiated. Several "straggler" tapes were also submitted by most of the manufacturers, containing the allowed remaining 10% of data not previously submitted. For one of the larger manufacturers, a tape containing data from newly found cassettes spanning several months was submitted, after Department approval and after arrangements were made with Department data processing staff. Overall, this shows a marked improvement in

data submittals which resulted from the efforts expended by the Department and the Registry in program year 1990, educating the manufacturer data managers and field service managers.

There were two additional data management issues which arose during 1991, and had an impact on data processing. The first was the delay in the routine renewal of the contract for services between the Department and the Regency Computer Network (RCN) at the State College, mentioned earlier. This resulted in an interruption in service, such that no data submittals could be processed, nor could any requests for any inspection data (recent or historical) be accommodated. The delay lasted for roughly four months, until the paperwork was routed through the appropriate channels.

The second issue had to do with the future of the data system at RCN. During the last quarter of 1991, the Department was informed by RCN that it would be no longer providing data processing services on its CYBER system (the system on which most of the I/M data are processed), and that, as of July 1, 1992, all services would be offered in a VAX environment. This began a scoping and planning process for data conversion and migration that will be addressed in the 1992 Annual Report. It is, however, a conversion and implementation process that is currently underway and on schedule.

4. THE NEW CLEAN AIR ACT AMENDMENTS

The new Clean Air Act Amendments, which were signed into law by the President on November 15, 1990, require states designated as "serious" non-attainment for ozone or carbon monoxide to demonstrate air pollution reductions of at least 3% per year, beginning six years after the date of enactment, in addition to the 15% reduction from baseline emissions. Within two years of enactment, states designated as serious must submit revisions to their State Implementation Plans (SIP revisions) to provide for an enhanced I/M program to reduce HC, CO, and NO_x emissions. Enhanced I/M programs will be comprehensively described in a Rule issued by EPA (Proposed Rule and Preamble were published in the July 13, 1992 Federal Register), as required by the Act.

During 1991, the Department spent time reviewing the Draft Guidance, which was published in April. Detailed comments were submitted to EPA. Subsequent to that effort, EPA decided to initiate formal rulemaking.

The Final Rule will present a performance standard with which all states will be required to comply. It will comprise emissions testing, including on-road emissions testing; a tampering and functional inspection of emission control equipment; denial of waivers for warranted vehicles or repairs

related to tampering; a $450 cost waiver expenditure requirement for emission-related repairs not covered by warranty; enforcement through vehicle registration denial; centralized testing unless the state can demonstrate a decentralized program is equally effective; a functional inspection of the emission control diagnostic system (on-board diagnostic, or OBD, systems); fuel tank pressure testing; and canister purge testing.

Also during Program Year 1991, the Massachusetts Legislature enacted a Resolve which created a Special Commission to investigate, study, and revise the vehicle emissions Inspection and Maintenance (I/M) Program. The Commission will provide a forum in which all issues concerning the new I/M requirements from the new Clean Air Act Amendments (CAAA) can be discussed, in order to fairly examine the alternative I/M program types and inspection procedures. It will assure that the views of those affected by the program changes are adequately represented and articulated. Furthermore, it calls for the development of legislative initiatives to affect the necessary statutory changes.

APPENDICES

APPENDIX A.

Request for Data for 1991 I/M Annual Report

* APPENDIX B & C COULD NOT BE REPRODUCED BUT ARE AVAILABLE FOR REVIEW AT DEP'S BOSTON OFFICE.

M E M O R A N D U M

TO: Harold Evans

FROM: Leah Weiss LW

DATE: April 17, 1992

RE: Request for Data for 1991 I/M Annual Report

In order to fulfill the reporting requirements for the 105 Grant, certain data from the I/M Transaction File need to be processed by BWP/MIS and analyzed by BWP/AQ. Therefore, we are requesting that the following statistics be generated, based on the I/M Transaction File (across all emission analyzer types) for the period January 1 - December 31, 1991:

1. Total Number of Inspection Transactions.

2. Total Number of Initial Emissions Inspections Performed. This involves totalling the number of "I"s in the "Test Type" field for all analyzer types for all vehicles for which the model year ("Veh Year" field) is 1977 or greater. Not included in this category are vehicles whose "Fuel Type" is "D" nor whose "Vehicle Type" is "C", "D", or "E".

3. (a) Total Number of Vehicles Exempted from the Emissions Inspection. This involves adding up the number of transactions for which the model year is 1976 or less, or "Fuel Type" equals "D", or "Vehicle Type" equals either "C", "D", or "E."

   (b) Total Number of Properly Exempted Vehicles. This involves counting the number of vehicles described in #3 (a) above for cases where "Vehicle Year" equals 1976 or less, or "Vehicle Year" equals 1991 or greater, or "Fuel Type" equals "D", and "Vehicle Type" equals "E".

   (c) Total Number of Vehicles Exempted from the Emissions Inspection but should not have been Exempted. This involves counting the number of vehicles described in #3 (a) above for cases where "Vehicle Year" equals 1977 or greater, or "Vehicle Year" equals 1991 or less, and "Vehicle Type" equals "E" and "Fuel Type" = "G".

   (d) Total Number of Diesel Vehicles Inspected. This involves counting the number of vehicles described in #3 (a) above for cases where "Fuel Type" equals "D".

4. (a) Total Number of Vehicles Receiving Initial Emissions Inspections. There has been a trend of one vehicle receiving multiple, consecutive initial inspections. Therefore, we would like to identify the number of vehicles receiving initial inspections. This involves counting (and totalling) the "I" in the "Test Type" field for the conditions described in #2 above, only if the characters in the "Plate Num" field are not identical.

(b) Breakdown of Total Number of Vehicles Receiving Initial Emissions Inspections by Cutpoint Category: This involves a breakdown of the data requested in #4 (a) above for the following cutpoint categories:

Vehicle Year	No. of Initial Inspections
1981 and greater	
1980	
1977-1979	

5. Pass/Fail Status of the Vehicles Receiving Initial Emissions Inspections. Maintaining the same format and conditions described in #4 (a) and (b) above, the pass/fail status should be ascertained, based on emissions testing only (HC and/or CO failures). NOTE: WE WANT TO BE ABLE TO ASCERTAIN THE NUMBER OF INITIAL PASSES, SO PLEASE KEEP TRACK OF ALL TOTALS. Failures in RPM or CO2 are not counted as emissions failures, and should be tallied separately. Failures in either CO2 or RPM supersedes a failure in CO and HC, and the transaction should not be counted as an emissions failure, no matter what the readings are in the HC and CO fields, and if they appear to be failures. Reporting of the data should be as follows:

Vehicle Year	# Initial Inspections	# Initial Passes	# Emission (HC/CO) Failures	#CO2/RPM Failures
1981+				
1980				
1977-1979				

6. (a) Number of Vehicles which Failed Initial Emissions Inspection and Subject to a Retest. Involves totalling the number of vehicles which have failed an initial emissions test (as described in #5 (a) and (b) above) and was subject to a subsequent retest ("R" in the "Test Type" field). This includes matching the initial test and retest by license plate number, and reporting as follows:

Vehicle Year	# Initial Emission Inspections Failures	# Retested Vehicles
1981+ greater		
1980		
1977-1979		

(b) Pass/Fail Status of Retested Vehicles. For the vehicles selected out as described in #6 (a) above, the pass/fail status should be ascertained, based on emissions testing only (HC and/or CO failures). Failures in RPM or CO2 are not counted as emissions failures, and should be tallied separately. Failures in either CO2 or RPM supersedes a failure in CO and HC, and the transaction should not be counted as an emissions failure, no matter what the readings are in the HC and CO fields, and if they appear to be failures.

(c) Total Number of Retested Vehicles which were Exempted on the Retest. This involves counting the number of vehicles described in #6 (a) above for cases where "Vehicle Type" equals "E".

Reporting of the data for #6 (b) and (c) should be as follows:

Vehicle Year	# Retested Vehicles	# Retest Passes	# Retest Emissions (HC/CO) Failures	# Retest Exempts
1981+				
1980				
1977-1979				

I understand that, with the exception of two manufacturer tapes that need processing, the data set for calendar year 1991 is nearly complete and ready to be processed. We would like to have this data processed and available to us by June 5, 1992. If you anticipate any problems in processing this request, please let us know as soon as possible. Thank you for your continued cooperation.

cc: Jim Neely
Skip Russell